



Lessons From Lake Malawi Exhibition

*Fisheries Governance
in the Colonial Era*



12 August 2025



14:30 UK / 15:30 MW



David Livingstone Birth Place
& Zoom



University of
Strathclyde
Glasgow





Our experts



Dr David Wilson



Prof Bryson Nkhoma



Dr Charles Knapp

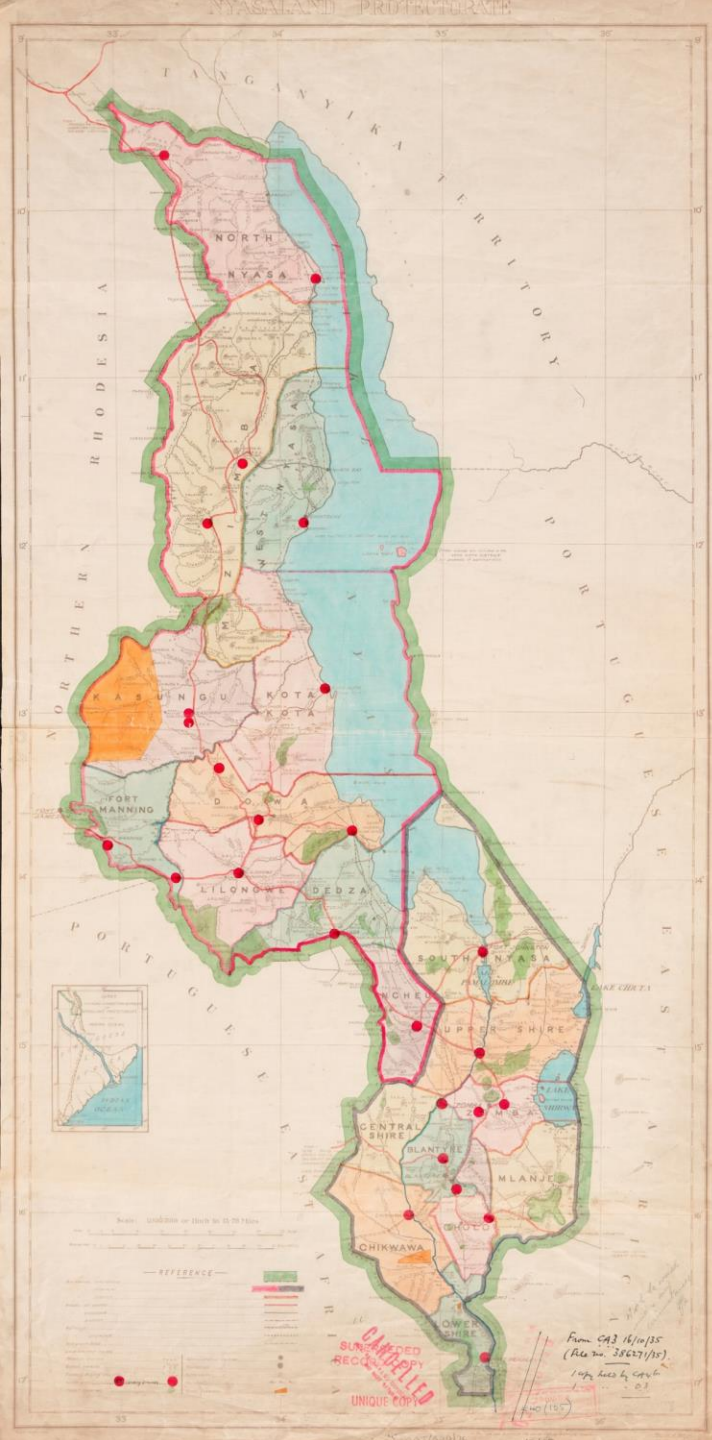


Dr Wellman Kondowe



University of
Strathclyde
Glasgow





Fishing (in) the Past to Inform the Future: Lessons from Lake Malawi and Mbenji Island

 Natural
Environment
Research Council

 Arts and
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Research Council

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Strathclyde
Glasgow



Meet the Team



Dr Elias Chirwa



Prof Bryson Nkhoma



Prof Wapulumuka Mulwafu



Dr Wellman Kondowe



Prof Tracy Morse



Dr Charles Knapp



Dr David Wilson



Dr Milo Gough



Centre for Environmental Policy
and Advocacy

Introduction to the Project

A comparative investigation of the history of two distinctive fisheries management regimes in Lake Malawi originating in the mid-twentieth century:



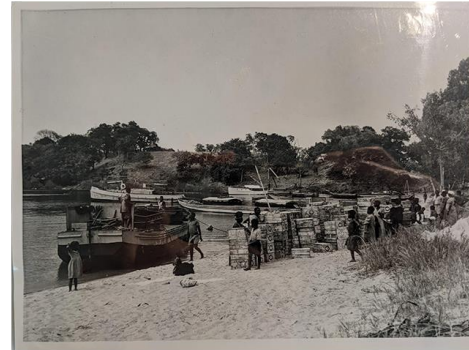
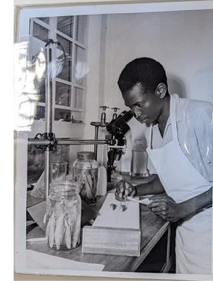
Colonial Fisheries Governance & Mbenji Island Fisheries Governance

Exploring the **principles** and **ideologies** underpinning these regimes and their **long-term impacts**

Three research components

- Archival Research
- Oral History
- Environmental Sampling

A Brief History of Colonial Fisheries Governance



“The Lake is without doubt heavily fished by natives and by Europeans using modern appliances and effecting catches on a wholesale scale.”

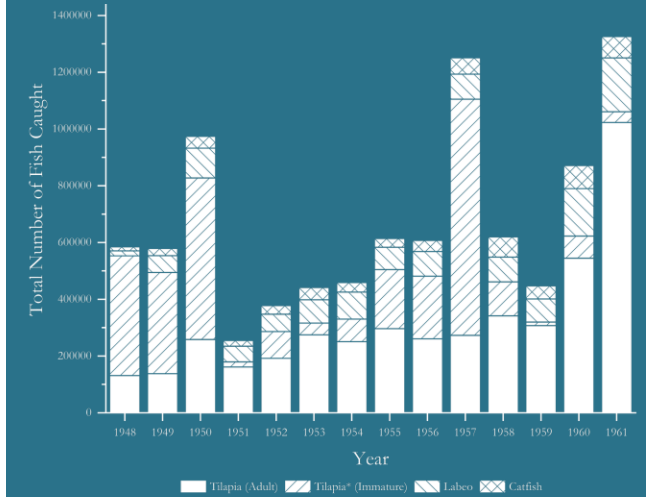
- Governor Harold Kittermaster, 31 October 1938

“The easiest way to make the fullest use of all the fish stocks on a long-term basis would probably be by having unified and Government control over all the separate fisheries.”

- Rosemary Lowe,

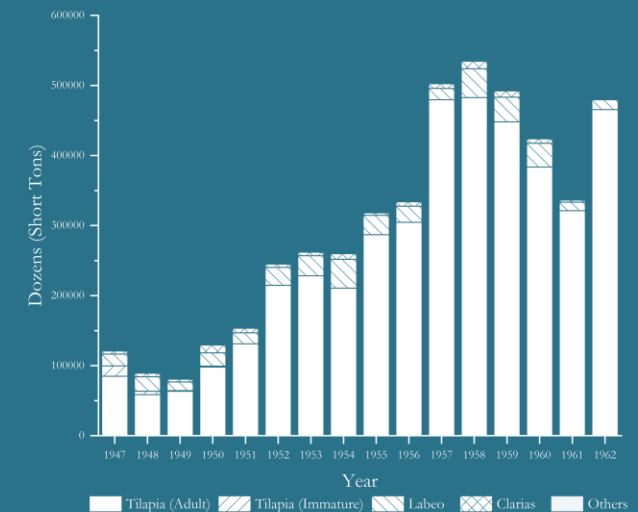
Report on the Tilapia and other Fish and Fisheries of Lake Nyasa, 1945-7 (1952)

African Fisheries:
Summary of Observed Catches at Recording Stations Per Year
(Tilapia, Labeo, & Catfish), 1948-1961



* Small fish, not counted individually but measured in four gallon tins.
Number of tins converted to numbers of fish on basis of average number per tin. Round figures only.

Settler Fishers
Total Catches of Important Species in South-East Arm, 1947-1962



A Brief History of Mbenji Island Fisheries

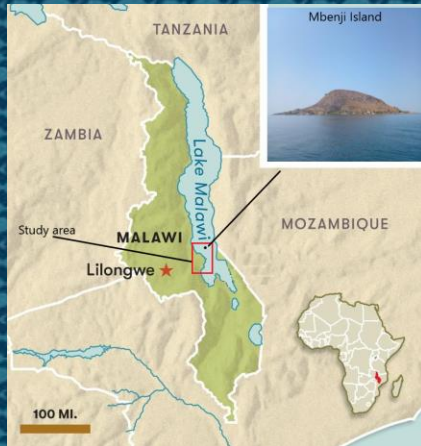
“We have set these strict regulations to preserve Mbenji Fisheries for the future generation.
We will not accept any violations.”

- Chief Makanjira, 15 April 2023

- Oral histories were conducted with 24 elders from Mbenji, including Senior Chief Makanjira, to understand the origins and history of Mbenji Fisheries management.
- We also attended opening and closing ceremonies where speeches about the origins and progress of Mbenji Fisheries were shared.
- On the origins, Mbenji started in the 1950s by two prominent fishers from Likoma, Mr Kalemba Assani and Mr Kampunga.
- As fishing expanded, Chief Makanjiira established regulatory laws for fishing and settlement.
- Since the 1990s, the government recognised Mbenji fisheries regime as part of decentralisation.
- The success of Mbenji revolves around: the **charismatic leadership** of Senior Chief Makanjira; **strict regulations** of fisheries in the area; and **traditional beliefs**.



Fisheries Analysis in Mbenji and Surrounding Waters Background



- Two main fisheries governance schemes in Lake Malawi:
 1. Government-controlled scheme (based on colonial/western science/laws)
 2. Traditional scheme (based on traditional laws, indigenous knowledge) at Mbenji Island under Senior Chief Makanjira
- These regimes responded to similar concerns of potential overfishing but were based on different authorities and outlooks
- It had been rumoured Mbenji fisheries were doing better than government-managed fisheries, but scientific evidence was lacking: **Was it true? If true, was it due to management? Or water quality?**



Fisheries Analysis in Mbenji and Surrounding Waters

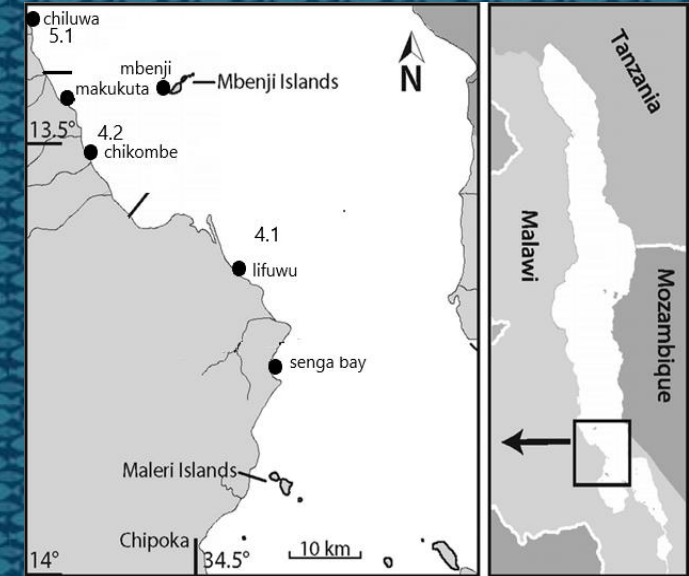
Objectives

i) Main Objective

- Analyse the performance of fisheries at Mbenji Island and at surrounding Government-controlled areas in Salima, Lake Malawi

ii) Specific Objectives

- Assess water quality conditions between Mbenji and Government-controlled areas
- Compare the health of fish stocks at Mbenji and Government-controlled areas



Methodology

336 water quality sampling stations were analysed for physico-chemical and biological parameters

462 fish samples (Utaka) were analysed for their TL, BW, LWR



Table 2: Sample size (N) of water quality stations and fish samples

Fishing Strata	4.1	4.2	5.1	Mbenji	Total
Water Quality Sampling Stations (N)	90	82	82	82	336
Fish Samples (N)	154	103	154	51	462

NB: 4.1: Senga Bay; 4.2: Domira Bay; 5.1: Nkhotakota South; N: Sample size

Results

Water quality **did not differ** significantly

	Unit	Fishing strata				F-value	p-value
		5.1	4.2	4.1	Mbenji		
Temp	°C	24.3±0.4	24.5±0.3	24.2±0.3	24.4±0.2	1.76	0.15
DO	mg L ⁻¹	7.4±0.1	8.2±0.2	8.3±0.4	8.5±0.6	1.01	0.09
Z _{SD}	m	6.2±2.4	4.8±1.5	5.8±1.7	4.5±2.4	1.14	0.12
pH	-	8.3±0.1	8.4±0.2	8.2±0.2	8.4±0.1	1.20	0.12
Cs	µS cm ⁻¹	243±4.8	245±7.1	244±9.2	246±8.5	3.75	0.17
TDS	g L ⁻¹	0.26±0.1	0.28±0.1	0.27±0.1	0.29±0.1	1.03	0.09
SRP	µmol L ⁻¹	2.7±0.3	3.8±1.1	2.8±1.5	4.5±1.0	2.28	0.10
Chl-a	µg L ⁻¹	1.2±0.4	1.4±0.3	1.7±0.5	1.8±0.6	2.19	0.12

Fish were **heavier (plump)** at Mbenji, and **slender** in government areas

	Stratum			
	5.1	4.2	4.1	Mbenji
$W = a L^b$	0.059 (L) ^{2.305}	0.111 (L) ^{3.114}	0.034 (L) ^{2.761}	0.009 (L) ^{3.574}
R ²	0.980	0.983	0.848	0.987
SE(b)	0.026	0.040	0.094	0.058
CI(b)	2.253-2.357	3.034-3.194	2.574-2.949	3.457-3.691
p-value (t-test)	0.000	0.160	0.012	0.000
p-value (regression)	0.000	0.000	0.000	0.000
Growth	-ve allometry	Isometry	-ve allometry	+ve allometry
Kn±SD	0.922±0.05	1.186±0.09	1.199±0.75	1.207±0.08

Fisheries Analysis

Conclusions & Recommendations

- The Mbenji fish stocks are healthier than the Government-controlled fisheries, not because of water quality differences but likely their management attributes.
- Communities can take charge of their fisheries resources, with government merely providing support
- Longer closed season allows fish to breed and grow more successfully
- Total ban of fishing gears during closed season conserves diverse fish stocks more effectively by preventing unintended fishing
- Stringent enforcement, with greater surveillance and high certainty of detection and deterrence are important aspects of successful fisheries management
- Government, NGOs, and other partners need to provide tangible support to fishing communities for the development of a successful self-regulated fishery

The catches of lighter fish in nearby government-regulated waters suggests overfishing is occurring ...



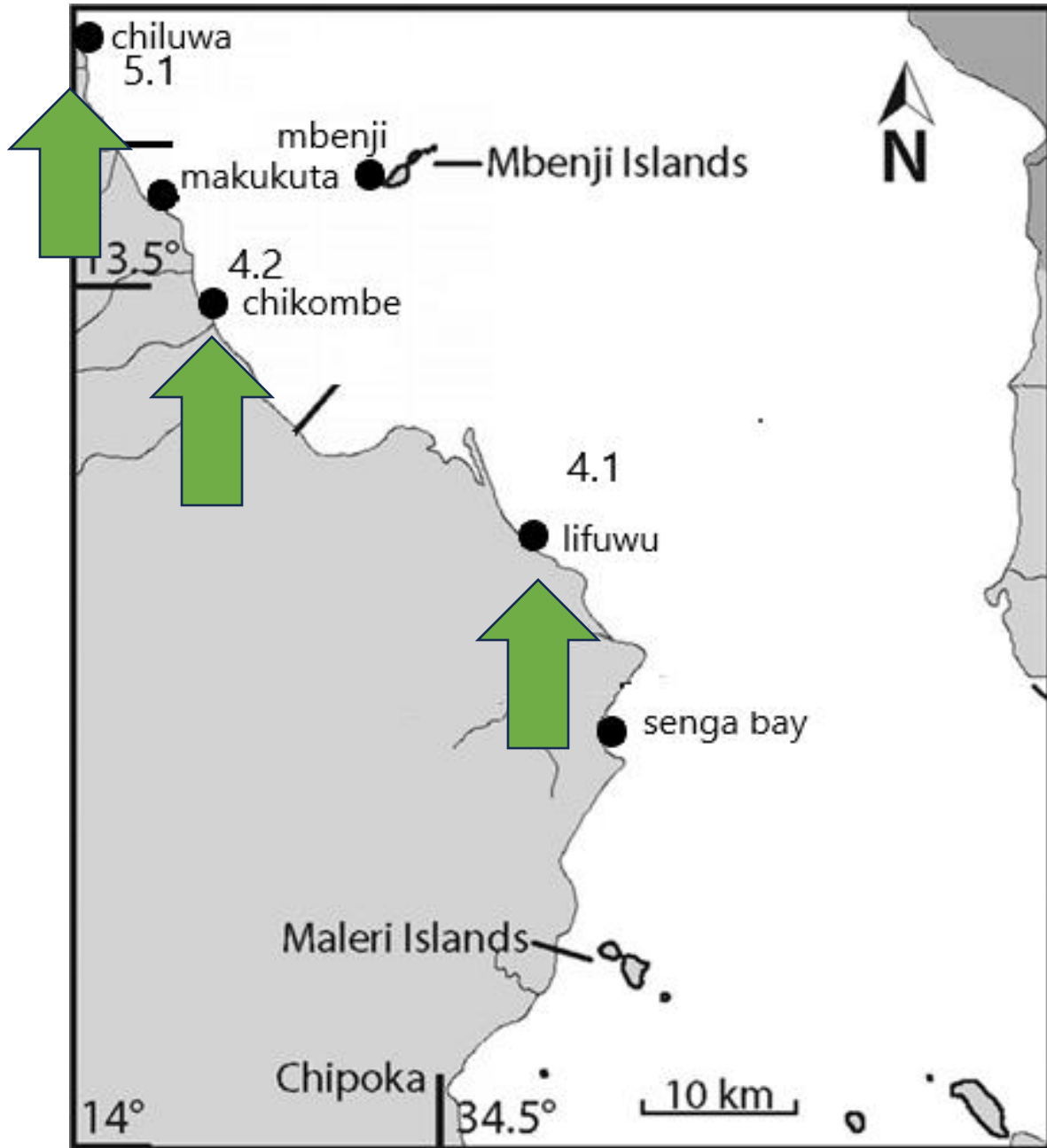
... whereas the heavier fish caught at Mbenji indicates much more sustainable fishing levels



Management attributes	Government areas	Mbenji
Length of closed season	2 months	4 months
Nature of closed season	Target Chambo	All fish stocks
Gears restricted	Beach seines	All gears
Environmental protection	No rules	Environment protected
Enforcement	Inconsistent	Very stringent, timely
Sanctions/punishment	Lenient	Serious fines
Knowledge base	Western science	Indigenous knowledge

Table: Current management attributes in government and Mbenji waters

Tracing Pollutants in the Sediment



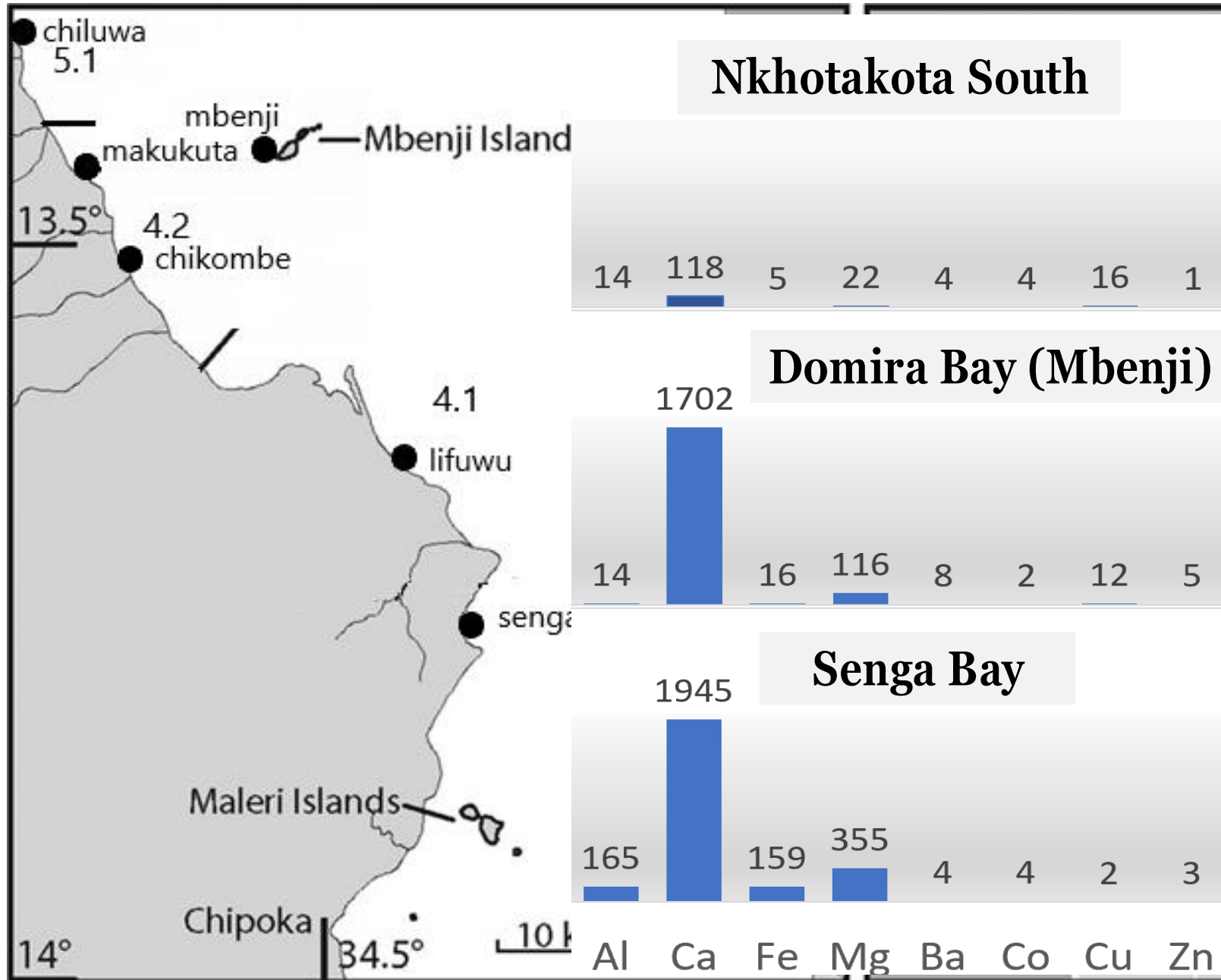
Sediments were collected to obtain a sense of current and historical environmental pollution (60cm)

Same locations as the water sampling:

- 4.1: Senga Bay
- 4.2: Domira Bay (Mbenji)
- 5.1: Nkhotakota South



Tracing Pollutants in the Sediment

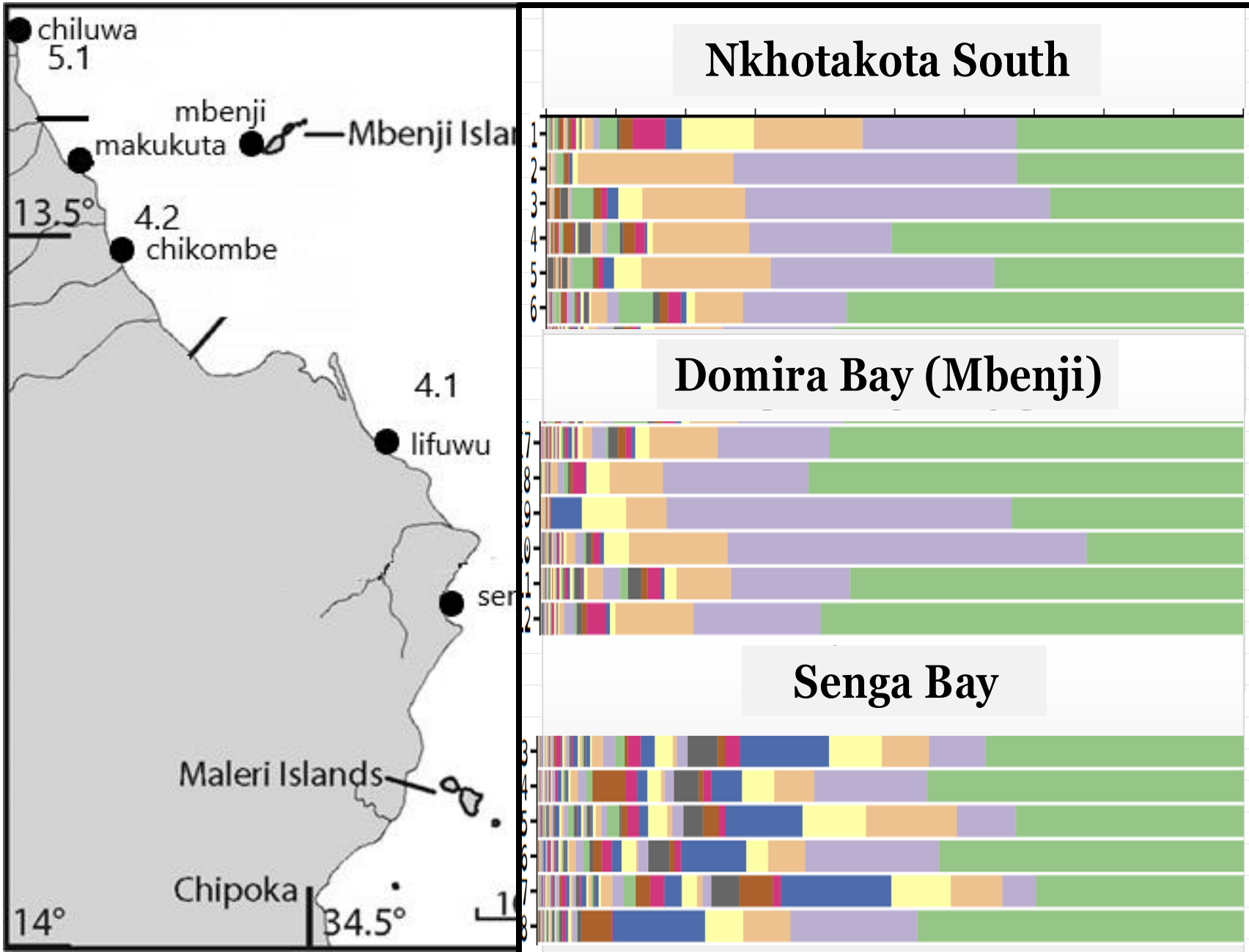


BIOAVAILABLE METALS

were measured to determine possible pollutant levels (mg/kg)

- Most metals (those on left) reflect the geological conditions
- Metal (on the right) represent possible pollutants
- Nkhotakota South has highest levels of Copper
- A lot of Iron at Senga and Domira Bays

Tracing Microbes in the Sediment



Bacterial community:

- Nkhotakota South and Domira Bay have similar abundances and bacterial diversity with highest levels of faecal contamination
- Senga Bay has 10x more bacteria, and a greater diversity.
- Pathogen concentrations increasing in all areas across time
- **Green = γ-proteobacteria** (very common, Gram negatives)
- **Purple = Bacteroides** (commonly associated with faeces/gut microbiome)
- **Orange = α-proteobacteria** (soil bacteria, plant symbionts)
- **Yellow = Firmicutes Clostridia** (Gram-positive, soil bacteria)

Tracing Microbes in the Sediment

Extracellular DNA of common fish pathogens

Targeting the DNA in the water can forewarn of vectors (and invasive species)

- *Aphanomyces invadans*
- Acanthamoebae

Becoming very prevalent at Senga Bay



Photo: Kiryu et al. (2003) Infectivity and pathogenicity of the oomycete *Aphanomyces invadans* in Atlantic menhaden *Brevoortia tyrannus*. *Diseases of Aquatic Organisms* 54: 135-146

AMR risk

- Often associated with environmental pollution
- Identified across all sampled areas
- Can impact food security and health.

Relative abundance of resistances genes (per "total bacteria")

	4.1	4.2	5.1	Prevailing genes
Aminoglycosides	6.3%	6.9%	12.6%	<i>aac(3)</i> , <i>apcN</i> , <i>aadA</i> , <i>aac(6)</i>
Beta lactamases	4.3%	4.4%	8.5%	<i>bla_{OXY}</i> , <i>penA</i> , <i>bla_{SFO}</i> , <i>bla_{MIR}</i> , <i>bla_{ACT}</i>
Integrases	0.4%	0.3%	0.0%	<i>int1</i>
Multidrug resistance	6.2%	6.5%	12.6%	<i>oprD</i> , <i>mdtH</i> , <i>mdtA</i> , <i>emrD</i> , <i>mexA</i>
Mobile genetic elements	11.2%	12.6%	25.7%	IS1111, Tn5403, orf37-1526, IS1247, IS1133
MLSB	5.5%	7.4%	15.1%	<i>ermX</i> , <i>mphA</i> , <i>pncA</i> , <i>ermE</i> , <i>ercA</i>
Other	2.0%	1.9%	2.5%	<i>bacA</i> , <i>merA</i> , <i>arr3</i> , <i>qacEΔ1</i>
Phenolics	0.7%	0.7%	1.4%	<i>cmiV</i> , <i>cmlA</i> , <i>cmxA</i> , <i>floR</i> , <i>catA3</i>
Quinolones	6.2%	5.6%	9.5%	<i>qepA</i> , <i>qnrB</i> , <i>qnrS</i>
Sulphonamides	1.1%	0.7%	0.5%	<i>sul3</i> , <i>sul2</i> , <i>sul1</i> , <i>sul4</i>
Tetracyclines	1.4%	2.1%	4.2%	<i>tetD</i> , <i>tetG</i> , <i>tetL</i> , <i>tetA</i> , <i>tetR</i>
Trimethoprim	0.5%	0.8%	0.8%	<i>dfrA</i>
Vancomycin	2.0%	2.7%	6.6%	<i>vanT</i> , <i>vanA</i> , <i>vanHB</i> , <i>vanYB</i> , <i>vanB</i>
"Total bacteria"	10 ^{8.7}	10 ^{8.8}	10 ^{9.6}	Bacteria/gram sediment

Weaving Indigenous Knowledge Systems in Fisheries Management

Approximately **65%** of the world's land is owned and used by Indigenous Peoples and Local Communities.

Importance of engaging IPLCS:

- They possess significant knowledge, innovations and practices of their surrounding biodiversity and ecosystems.
- They have experienced changes over time, and intergenerational knowledge transfer systems and practices.
- They are resource users, right holders, and custodians of the environment. They also possess cultural practices which are important in understanding colonial and contemporary fishing practices.
- They can recommend best practices and those practices which are not sustainable in fisheries management.



Weaving Indigenous Knowledge Systems in Fisheries Management

Lessons from IPLCS

- Mbenji Island
- Chaone and Chidyamphiri Hills
- Lake Kazuni
- Lake Chilwa

IPLCs possess a large and impressive storehouse of local knowledge, innovations and practices about biodiversity and ecosystems and are better placed to contribute to their conservation.

The identities, cultures, and livelihoods are often deeply intertwined with their surrounding biodiversity and ecosystems and the services and benefits they offer.





OUR LEARNINGS

The successes at Mbenji are a result of the collective elements of the management regime so that the technical aspects cannot be simply isolated & applied elsewhere.

➤ LEGITIMACY & EMBEDDEDNESS

- Technical principles that recognise ecological complexities are not enough. Successes at Mbenji are a result of targeted technical regulations combined with strong leadership, proactive enforcement, long-term realisation of benefits, transparency, and embeddedness in existing institutions and beliefs.

➤ CONNECTEDNESS

- We need to better understand how far different management regimes connect with and are reliant on each other. Part of Mbenji's sustained success has been a result of the ability of fishers to make their livelihoods in government waters during the extended closed season.

➤ LEADERSHIP & COMMUNICATION

- Strong leadership has been crucial at Mbenji Island. This centres on shared accountability and responsibilities through the Mbenji Island Fisheries Committees as well as transparency and communication with fisheries participants through meetings and speeches during the opening and closing ceremonies that centre on news of successes and enforcement challenges.

➤ SUPPORT

- There needs to be greater governmental support for community management by providing tangible resources for instructive and enforcement activities. This includes resources for community-led science to gather and disseminate data that can inform situated management decisions.

➤ HISTORICAL AWARENESS

- We need to persistently acknowledge, consider, and address how the ideologies & beliefs driving past management regimes continue to shape present day governance practices, even as these adopt participatory language and institute new participatory frameworks.

Q & A

To learn more, view our StoryMaps,
and access a range of resources, please visit:
<https://www.colonialfisheries.com>

